Airborne Communications Node (ACN)

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Global Hawk

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Global Hawk: The Airborne Communications Node will develop and demonstrate a communications payload for the Global Hawk High Altitude Endurance (HAE) Unmanned Aerial Vehicle (UAV) to establish a self-deployable robust communications infrastructure without large in-theater assets through all phases of a conflict.

True Surrogate Satellite

- 42-Hour Endurance
- Above 60K Feet
- >70K Sq Mile Footprint
- 900 Lb Comms Payload
- Unmanned
- No Theater Infrastructure
- Self Deployable

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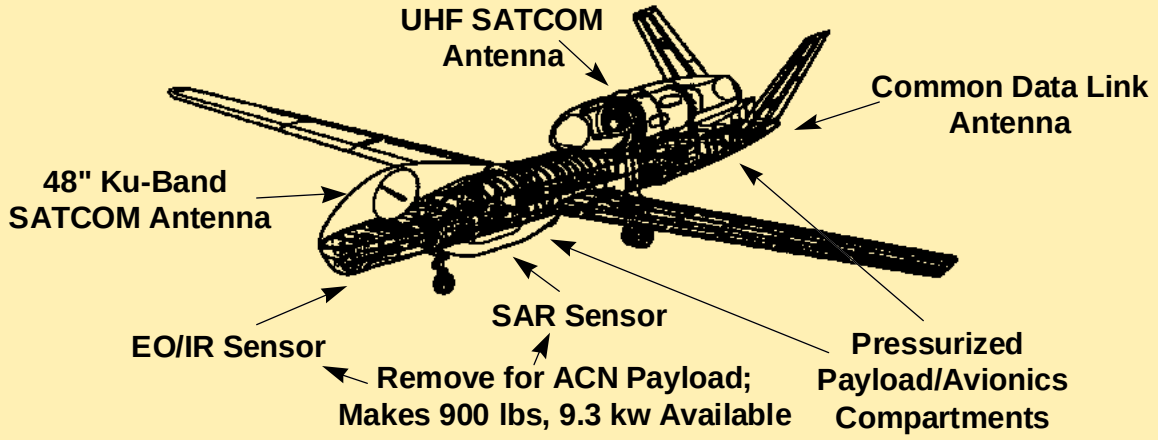
True Surrogate Satellite: The ACN provides “true surrogate satellite” capability by leveraging the self-deployable, unmanned, high altitude, long endurance characteristics of the Global Hawk, thereby minimizing the required in-theater communications infrastructure. Flying above 60,000 feet, the Global Hawk enables communications over a 70,000 square mile footprint and will host a communication payload weighing up to 900 pounds.

"GLOBAL HAWK" Specifications



Range	3000 NM/24 hr/3000 NM
Altitude	65,000 Ft
Loiter Time	42 Hrs
Loiter Velocity	343 Kts
Ferry Range	14,405 NM
Flight Critical Reliability	1 Loss in 200 (objective)
WB SATCOM	50 Mbps

Fuselage	
Width	4.8 Ft
Length	44.4 Ft
Wing	
Area	540 sq Ft
Span	116.2 Ft
Engine	AE3007H

Weights:	
Structure	3,920 Lbs
Empty (incl fluids)	7,648 Lbs
Payload	2,000 Lbs
Take-off-fuel	14,210 Lbs
Take-off-gross	24,000 Lbs

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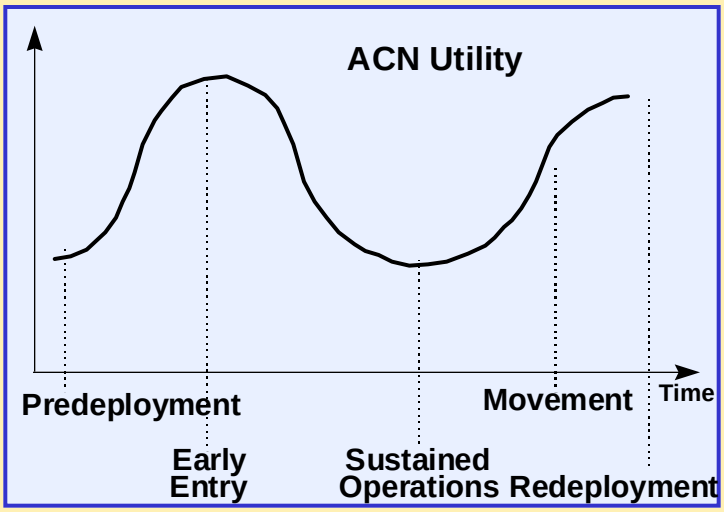
"Global Hawk" Specifications: The Global Hawk, depicted here, hosts the SAR and EO/IR sensor payloads. These payloads will be removed to accommodate installation of the ACN payload, providing up to 6 kw of prime power. The SATCOM (Ku and UHF) and CDL equipment will remain for usage in conjunction with the ACN.

Communications Needs

- **Pre-Hostility Phase**
  - Only SOF and Reconnaissance Elements Present
  - Command From Remote CINC
- **Enroute and Early Entry Phase**
  - Arrival and Insertion of Ground Forces Ashore
  - Establishment of CJTF Ashore
  - Greatest Logistics Strain
  - Most Austere C4I Environment
- **Sustained Operations**
  - Consolidation and Expansion of Enclaves
  - Rapid Maneuvers
  - Range Extensions
- **Redeployment**
  - Departure of Combatants



Needs Vary With Scenario

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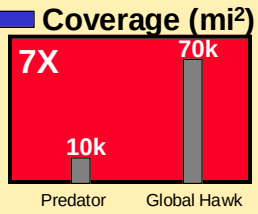
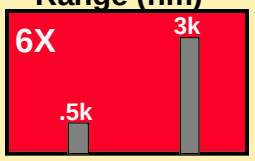
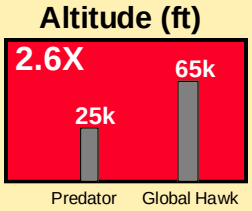
Communications Needs Tied to Contingency Phases: The ACN supports communications needs associated with all phases of a contingency, including pre-hostility, en route and early entry, sustained operations and redeployment. As shown in the graph, ACN utility is maximum for those periods of time preceding establishment of the communications infrastructure within the theater of operations.

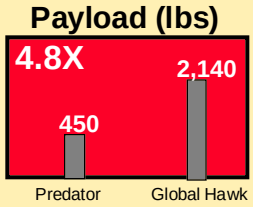
Platform Comparison

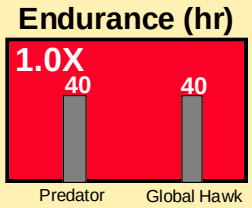
	MAE Tier II "Predator"	HAE UAV Tier II + "Global Hawk"
Missions	EO/IR or SAR	Tactical C3: EO/IR, SAR; TMD
Deployability	Not Self Deployable	Self Deployable Worldwide
Endurance	> 40 Hours	> 40 Hours
Range	500 nm	3000 nm/24 hrs/3000 nm
Altitude	25,000 ft (In Commercial Air)	65,000 ft (Above Commercial Air)
Comms Footprint	115 Mile Diameter	300-400 Mile Diameter
Payload Capacity	450 lbs	2,140 lbs
Flight Critical Reliability	?	1 loss in 200
Air Vehicle Program QTY	50 Planned to Purchase	2 Initial ACTD (8 Pending Decision)
Survivability	Within Enemy Air Defense	Threat Warning, Limited ECM











Bottom Line: Global Hawk - True Surrogate Satellite

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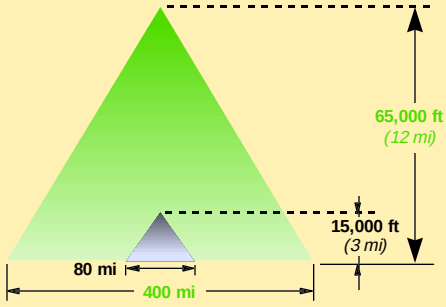
Platform Comparison: The utility of the ACN aboard the Global Hawk is well illustrated by comparing it with installation on the Medium Altitude Endurance (MAE) Tier II "Predator." As shown in the chart, a seven-fold increase in coverage area results from the increased altitude (2.6X) of the Global Hawk. A six-fold increase in range is also provided together with a nearly five-fold increase in payload weight, greatly increasing the number of services that can be provided.

Why Not ACN on Aerostat?

	AEROSTAT	GLOBAL HAWK
ALTITUDE: (ft)	17,500	65,000 (3.7X)
COVERAGE: (mi^2)	5,090	70,000 (13.9X)
PAYLOAD: (lbs)	> 2,000	> 2,000
RANGE: (nm)	Moveable If Anchored To Heavy Vehicle	3,000
DEPLOYABILITY:	Not Self Deployable	Self Deployable Worldwide
RESTRICTIONS:	Airspace Restrictions (Tethered)	No Airspace Restrictions
WEATHER:	In Weather	Above Weather



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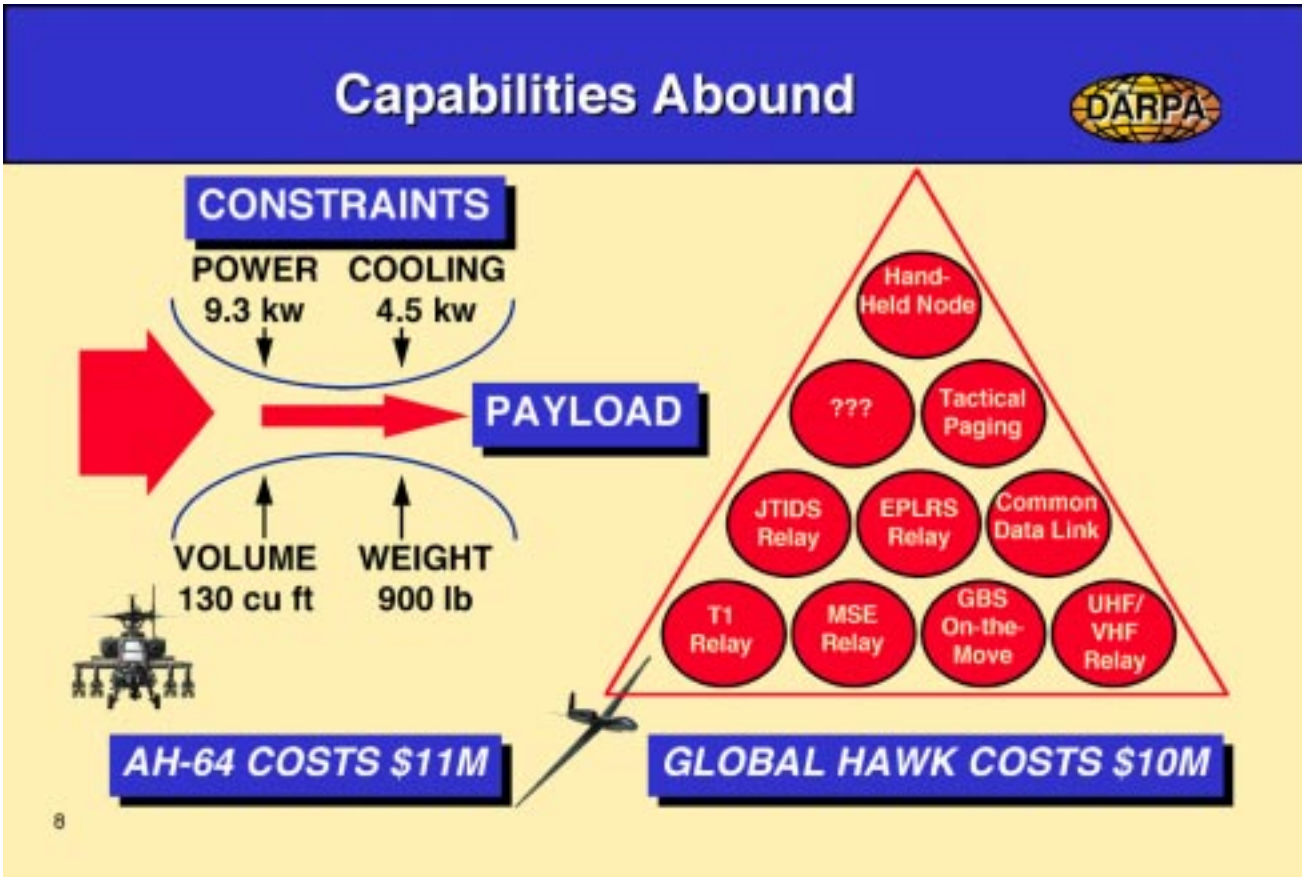
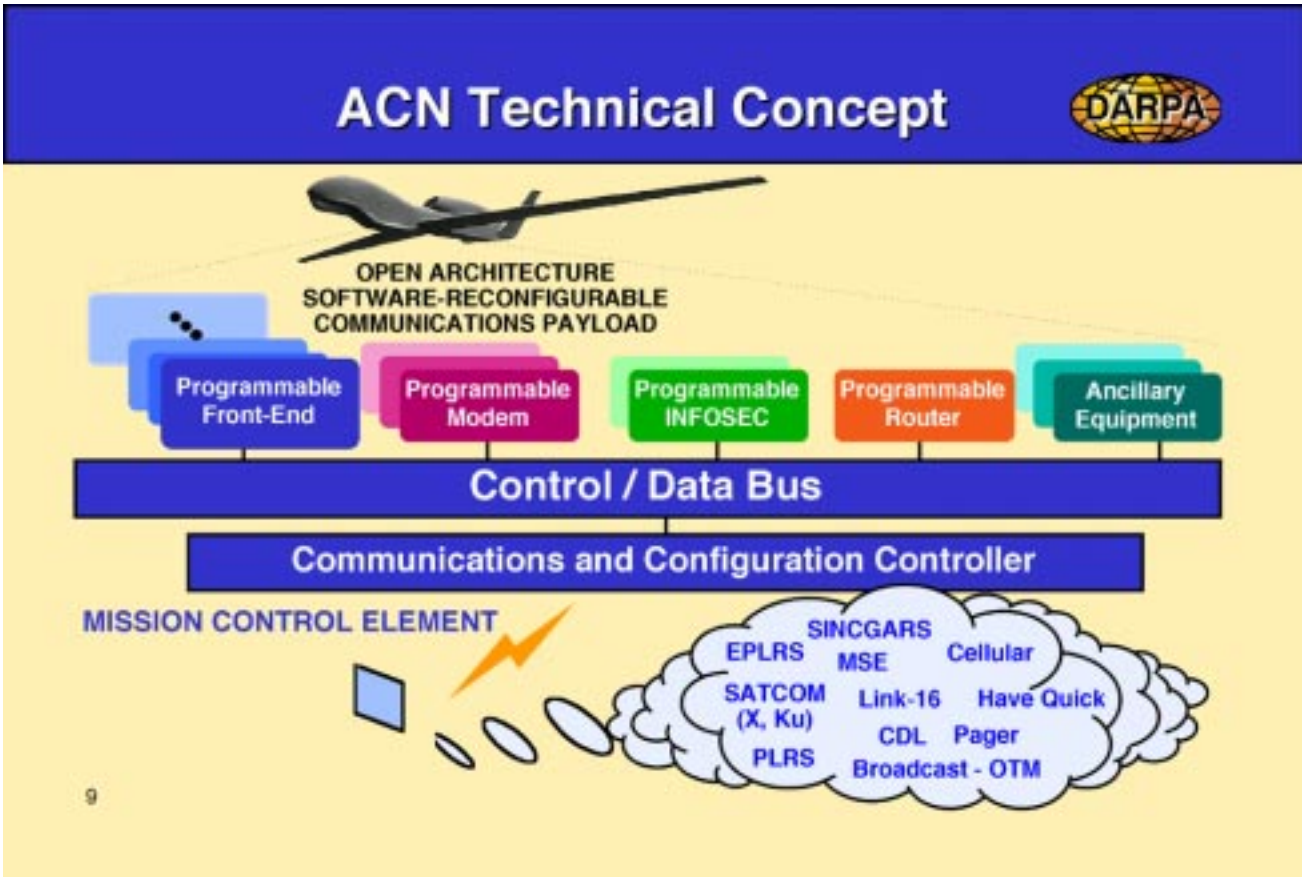
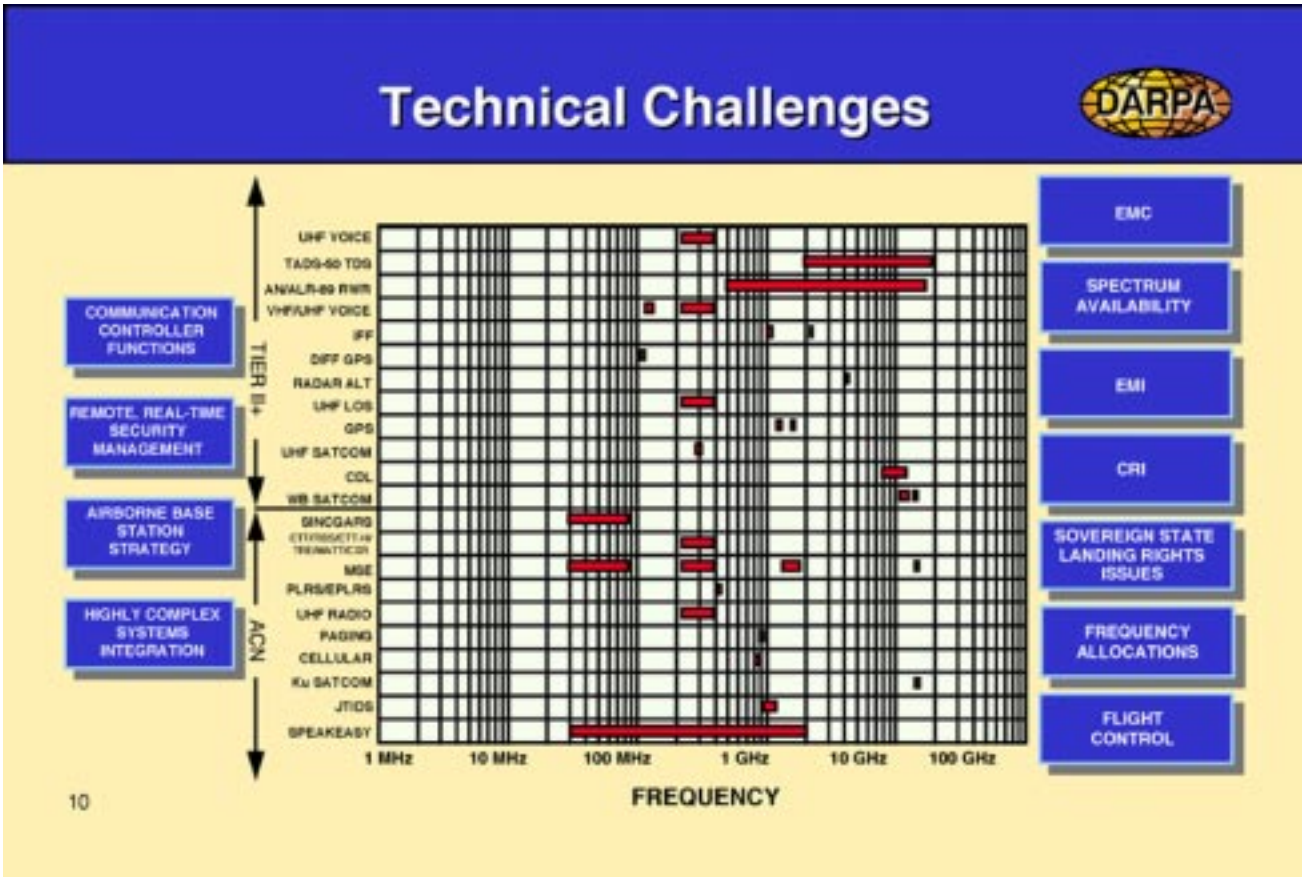
Why Not ACN On Aerostat?: ACN deployment comparison to an Aerostat yields similar conclusions to the Predator. At nearly four times the altitude, the Global Hawk provides about 14 times the coverage area for a given antenna aperture. The lack of self-deployability, airspace restrictions associated with tethering, weather and range restrictions all render ACN installation on the Aerostat undesirable.



Capabilities Abound: The payload constraints imposed by the Global Hawk, including available power, cooling, volume and weight, still allow numerous communications capabilities to be well supported. In addition to multiple VHF and UHF relay channels, MSE, EPLRS, JTIDS and T1 relays are planned, together with new services such as tactical paging, handheld cellular-like communications and broadcast to terminals on-the-move. This extensive set of capabilities is projected to cost a little less than the AH-64.



All attributes of the ACN package are designed to be dynamically reprogrammed while in flight.



Technical Challenges

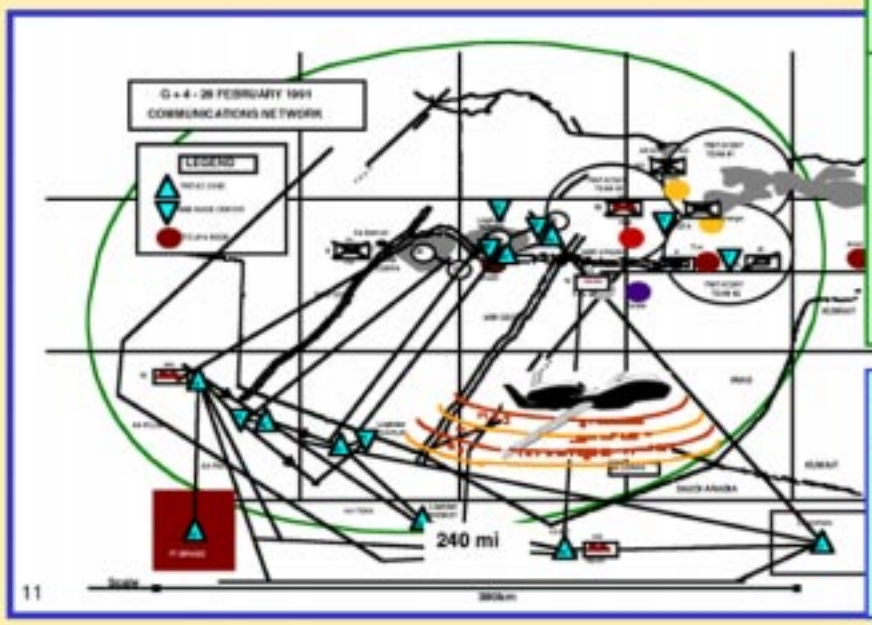
The technical challenges that must be met to implement the ACN functional capabilities are significant but not overwhelming. The hardest design problem is resolving the EMC of many radios on one platform. This can be done through a combination of efforts, including careful frequency management, antenna placements, and control of spurious emissions from transmitters and spurious responses in receivers.

There is significant challenge in realizing a communications controller onboard the ACN that can coordinate the operating modes of the payload with all other communications in the tactical theater as well as providing the message routing and translation capability necessary to realize the required Gateways.

Security management presents another important technical challenge. Control of encryption devices and keys (with over-the-air rekeying) is needed. The issues associated with gateways between systems protected by encryption must also be solved.

The development of a handheld radio system (patterned after commercial cellular systems) offers many benefits to the military. However, an airborne base station on the ACN must be developed to meet capacity needs (hundreds of channels) while addressing the issues of security and robustness (AJ) for the military customer. The development of a sectorized (high gain) antenna is necessary for long range service; a nulling capability should be included for jamming protection. Incorporating such an antenna array on the ACN without introducing undue drag is a challenge.

GLOBAL HAWK Desert Storm Scenario



ARMY COMMUNICATIONS

- One Theater Signal CMD
- Three Signal Bde HQS
- One JCSE
- Five EAC Signal BNS
- Eight Corps Signal BNS
- Eight DIV Signal BNS
- ~ 13,000 Soldiers

LIFT

- 40 C5s

- 24 Ships